REMARKS/ARGUMENTS

In the Office Action dated April 13, 2005, the Examiner made the following rejections of claims:

- Claims 1-6, 13-16, and 18-21 are rejected under 35 USC §102(b) as being anticipated by USP 5886346, issued to Makarov;
- Claim 12 is rejected under 35 USC §102(b) as being anticipated by USP 3925663, issued to Hiller et al.;
- Claims 7-8 are rejected under 35 USC §103(a) as being unpatentable over Makarov;
- Claims 9-11 are rejected under 35 USC §103(a) as being unpatentable over Makarov and further in view of Hiller et al.

The foregoing rejections are overcome by this response. As will be set forth in detail below, the references are deficient for at least the following reasons:

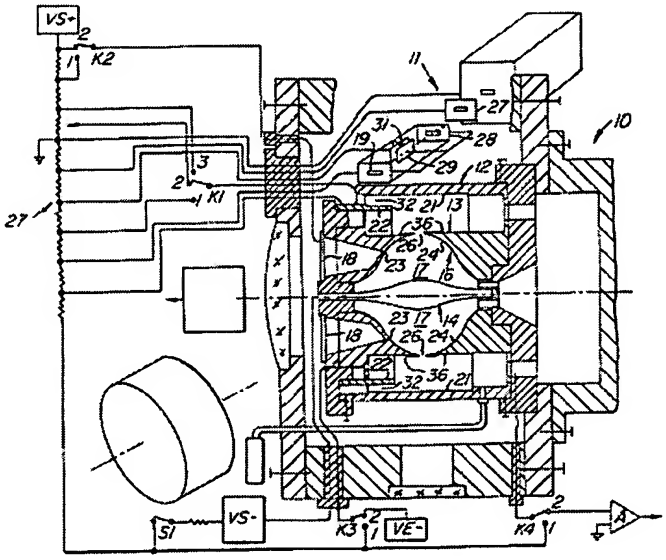
- *Makarov* and *Hiller* fail to make any reference to the structure and operation of many elements that are found in the claims of the present application;
- *Makarov* and *Hiller* fail to enable the overall invention set forth in the various claims; and
- *Makarov* and *Hiller* fail to disclose or suggest the combination of elements as arranged in the various claims.

THE CITED REFERENCES

The Makarov Patent

Makarov is directed to a mass spectrometer 10 having an ion source 11, an ion injection arrangement 12, field generator means 13 and one or more ion detectors 18. The field generator means 13 is defined by outer and inner shaped electrodes 14, 16 that form the boundaries of a measurement cavity 17 between them.

The ion injection arrangement 12 includes a pair of cylindrical electrodes 21 and 22. The ion source 11 directs ions towards a tangential inlet aperture (not shown) in the outer cylindrical electrode 21 and the ions enter an injection cavity formed between the cylindrical electrodes 21, 22 before proceeding through gap 26 and into measurement cavity 17. No measurements of the mass-to-charge ratios are executed by the ion injection arrangement 12. Rather, the ion injection arrangement 12 functions solely to direct ions into measurement cavity 17 for analysis.



When supplied with a voltage, the internal and external shaped electrodes 14, 16 produce a "hyper-logarithmic field" within the measurement chamber 17. The field is arranged so that the bottom of the potential well in the radial direction lies along the longitudinal axis of the measurement chamber 17. The ions that are injected by the injection arrangement 12 through gap 26 are trapped in the field and are forced to oscillate axially back and forth along the longitudinal axis within the confines of the well created by the hyper-logarithmic field while at the same time orbiting around the central electrode 14.

Mass analysis can be carried out using the mass spectrometer of *Makarov* in one of two modes. ***In each instance, it is the axial motion of the ions along the longitudinal axis -- not the orbital motion of the ions about electrode 14 -- that is used for the mass analysis.*** To this end, the outer electrode 16 is formed in two parts 23, 24. A voltage pulse is applied to one part 23 of the electrode 16 to drive the ions from the potential well in the axial direction along the longitudinal axis. Once this pulse has been applied, the voltages on the two parts 23, 24 are equalized and the ions oscillate with harmonic motion in the potential well of the field in the axial direction. One or both parts 23, 24 of the outer shaped electrode 16 are used to detect image current as the ions oscillate axially back and forth. The image current is used to produce a mass spectrum in a conventional manner.

The second mode of mass detection involves ejection of the ions from the potential well in the hyper-logarithmic field and along the longitudinal axis for collection on a detector. Application of the appropriate oscillating frequency between parts 23 and 24 for a given mass results in excitation of oscillations in the axial direction. After sufficient excitation has been attained, ions are ejected from the measurement chamber 17 along the longitudinal axis for detection by detectors 18.

The Hiller et al. Patent

Hiller is directed to an extended monopole mass spectrometer. The spectrometer includes a cylindrical electrode that is supported in the center of a square box electrode. This arrangement effectively forms four monopole channels, where each channel is bounded by a corner of the box electrode and a corresponding portion of the cylindrical electrode. Since this arrangement forms four monopole channels, there are four ion injectors at one end of the assembly and four detectors at the other end. The cylindrical electrode may be divided into separate portions that are electrically insulated from one another so that different mass selection

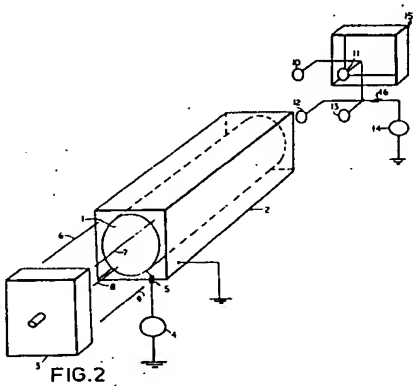


FIG.2

criterion (e.g., voltages) may be independently applied within each of the four monopole channels.

THE PENDING CLAIMS

It is respectfully submitted that all claims of the application are patentable over the art of record, taken singly or in combination. First, all rejections under 35 USC §102(b) must be withdrawn. As stated in ***Akzo N.V. v. United States Int'l Trade Comm'n***, 1 USPQ 2d 1241, 1245 (Fed. Cir. 1986), ***cert. denied***, 482 U.S. 909 (1987) (emphasis added) :

> Under 35 U.S.C. §102, anticipation requires that *each and every element of the claimed invention be disclosed in the prior art*. . . . In addition, the prior art reference *must be enabling*, thus placing the allegedly disclosed matter in the possession of the public.

Further, as stated in ***Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.***, 221 USPQ 481, 485 (Fed. Cir. 1984) (emphasis added):

> Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, *arranged as in the claim*.

Claim 1

Neither *Makarov* nor *Hiller* disclose or suggest the invention of claim 1. For example, neither reference discloses or suggests an ion selection chamber having an outer electrode and a plurality of inner electrodes and a corresponding power supply system that allows separation of ions of a selected mass-to-charge ratio from ions of non-selected mass-to-charge ratios based on the orbital periods of the plurality of ions in the selection chamber.

The arrangement of electrodes in *Makarov* does not correspond in any manner with the arrangement of the electrodes in claim 1. A concentric electrode arrangement using a single outer electrode and a single inner electrode is used in the ion injection arrangement 12 of *Makarov*. But this arrangement functions solely to inject ions into the

measurement cavity 17. The arrangement does not perform any ion selection functions and does not include the plurality of inner electrodes set forth in claim 1.

Similarly, the mass identification method used in *Makarov* is substantially different from the ion selection process in claim 1. *Makarov* ***solely*** uses the axial motion of the ions along a longitudinal axis for the mass measurement.[1] The ions either oscillate along the longitudinal axis, or are completely ejected from the measurement cavity 17 along the longitudinal axis. No attempt is made to discern between ions having different mass-to-charge ratios based on the orbital periods of the ions orbiting about the longitudinal axis.

Hiller does not add anything to the teachings of *Makarov* to disclose or suggest the invention of claim 1. In *Hiller*, the concentric arrangement of a cylindrical electrode within a box electrode is merely exploited to implement multiple, monopole chambers in a single device. Ion selection in each monopole chamber is executed in the conventional manner. No attempt is made to discern between ions having different mass-to-charge ratios based on the orbital periods of the ions orbiting about the longitudinal axis.

In the arrangement of claim 1, however, ions having different mass-to-charge ratios are discerned in the ion selection chamber based on the orbital periods of the ions. This is accomplished in claim 1 by constructing the ion selection chamber so that it has an outer electrode and a plurality of inner electrodes. A power supply system is connected to the electrodes to provide a constant voltage between the outer electrode and the plurality of inner electrodes. This allows ions having different orbital periods to enter a stable orbit about the axis of the ion selection chamber. The power supply system also selectively provides a changing voltage between the outer electrode and at least one of the plurality of inner electrodes. Among other things, this results in the separation of ions of a selected mass-to-charge ratio from ions of a non-selected mass-to-charge ratio based on the orbital periods of the ions about the ion selection chamber axis.

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[1]Although the claimed apparatus performs mass selection based on the orbital periods of the ions orbiting about an axis, the claims are not limited to apparatus that perform mass selection solely on this basis. Rather, the claims also encompass apparatus that use mass selection and/or discernment techniques and structures that are supplemental to the orbital period mass selection structures and operations of the claimed apparatus.

Claim 12

Neither *Makarov* nor *Hiller* disclose or suggest the invention of claim 12. The measurement cavity 17 of *Makarov* does not have a first electrode with a cylindrical interior electrode surface, a second electrode with an exterior electrode surface and a third electrode with an exterior electrode surface that is generally coextensive with an arcuate gap formed in the second electrode. Further, neither reference discloses or suggests that the electrodes may be connected to a power supply system that provides a DC voltage between the first and second electrodes and that selectively provides a switched DC voltage between the first and third electrodes. Each of these distinctive features can be found in claim 12.

Claim 13

Claim 13 is aimed at a method in which a plurality of ions are directed into a stable orbit about an axis within a substantially homogenous electric field and in which electric field perturbations are introduced so that only ions of a predetermined mass-to-charge ratio that have a predetermined orbital period about the axis remain in a stable orbit about the axis. No attempt is made to discern between ions having different mass-to-charge ratios based on the orbital periods of the ions orbiting about an axis in either *Makarov* or *Hiller*. Consequently, neither *Makarov* nor *Hiller* disclose or suggest the invention of claim 13.

Claim 19

Claim 13 is aimed at a method in which a plurality of ions are directed into a stable orbit about an axis within a substantially homogenous electric field in the interstitial region formed in a concentric electrode arrangement. Electric field perturbations are introduced by varying the electric power to the concentric electrode arrangement so that only ions of a predetermined mass-to-charge ratio that have a predetermined orbital period about the axis remain in a stable orbit about the axis.

New Claim 24

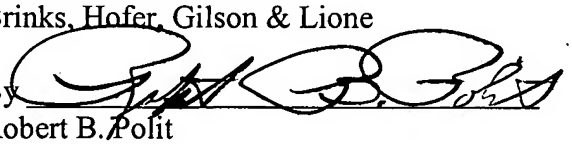
Claim 24 is directed to a method in which a plurality of ions are trapped into a stable orbit about an axis in an electric field formed between a plurality of concentric electrodes and in which ions having non-selected mass-to-charge ratios are selectively removed from the stable orbit based on the orbital period of ions having a predetermined mass-to-charge ratio. No attempt is made to discern between ions having different mass-to-charge ratios based on the orbital periods of the ions orbiting about an axis in either *Makarov* or *Hiller*. Consequently, neither *Makarov* nor *Hiller* disclose or suggest the method of claim 24.

CONCLUSION

In view of the foregoing, it is submitted that all of the claims currently pending in the present application are patentable over the prior art of record, taken singly or in combination. Each independent claim is separately patentable and, as such, each of the dependent claims is likewise patentable. Although the patentability of the dependent claims have not been separately argued, the right to do so is expressly reserved. Therefore, it is respectfully requested that a timely Notice of Allowance be issued in this case.

In the event that there are any unresolved issues concerning this application, the Examiner may contact applicants' representative, Robert B. Polit, at (312) 245-5309.

Respectfully submitted,
Brinks, Hofer, Gilson & Lione

By 
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